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(19)

(54) ROTARY BEARING DEVICE

(71) We, VECTOR BEARING CORPORATION, a Corporation organised and existing under the laws of the State of Colorado, United States of America, of 2090 West Bates Street, Englewood, Colorado 90110, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to rotary bearing devices and in particular to rotary bearing devices in which a load is transferred from one member to another.

Generally, rotary bearing devices comprise pairs of relatively rotatable inner and outer members which are circular and concentric. A load imposed on one of the members is transferred to the other member in a radial direction and so the load acts through the centres of the member. Where the load is the weight of a body connected to one of the members, the transfer of this load to the other member is in a vertical radial direction.

According to the present invention there is provided a rotary bearing device comprising an inner member and an outer member, one of said members being fixed and the other being rotatable with respect to the fixed member, said inner and outer members having complementary bearing surfaces wherein the bearing surface arranged on the inner member has a larger diameter than the bearing surface arranged on the outer member and the bearing surface on said inner member surrounds the bearing surface on said outer member, rolling elements being provided between inner and outer races arranged on the inner and outer members respectively, the race arranged on the fixed member being non-circular and acting to displace the rotatable member to a non-concentric position relative to the fixed member such that a load imposed on the fixed member is transferred to the rotatable member at a position spaced from the centre of the rotatable member in a direction transverse to the direction of action of the load.

The invention will be further described by example and with reference to the accompanying drawings, in which:—

Figure 1 is a side view, with parts cut away, of a bearing device embodying the invention; and

Figure 2 is an end view of the bearing device shown in Figure 1, partially sectioned along the section lines shown in Figure 1.

In the drawings a bearing device is indicated generally by the reference numeral 10. The device 10 comprises an inner member 15, which is fixed on an axle 12, and an outer member 22 which is fixed within a fixed housing 13, the axle 12 and housing 13 being relatively rotatable. The inner and outer members can be fixed to the axle and housing respectively by any suitable means, but are preferably fixed by means of interference fits.

Two pairs of complementary frusto-conical bearing surfaces are arranged on the inner and outer members. Each pair of surfaces comprises a frusto-conical surface 24 on a side member 23 which is fixed to the outer member 22 and a frusto-conical surface 16 on the inner member 15. The side members 23 may be integral with the outer member 22 or they may be separate for purposes of machining and assembly. The two pairs of frusto-conical surfaces are spaced apart axially, the large diameter ends of the pairs being adjacent. The frusto-conical surfaces 16 on the inner member 15 are co-axial with the inner member and surround the frusto-conical surfaces 24 which are supported by, and co-axial with, the outer member 22. The frusto-conical surfaces 16 are of generally larger diameter than the frusto-conical surfaces 24, hence the inner member 15 can be non-concentric with the outer member 22.

In the outer surface of the inner member 15 is a series of depressions 17, and in each depression a bearing ball 19. The bearing balls 19 are received in a race 26 in the outer

member 22. The race 26 is non-circular and comprises a major portion 28 of substantially constant distance from a point in the plane of the race and a minor portion 30 of smaller distance from the said point.

When the bearing device is in use, the bearing balls 19 engage the race 26 in the region of the first portion 30 and act to displace the inner member 15, relative to the outer member 22, to the limit of radial displacement allowed by the complementary bearing surfaces 16 and 24. Thus the inner member 15 is in a non-concentric position with respect to the outer member 22. The inner member 15 is supported by the outer member 22 only in the region of the first portion 30 by a combination of the interaction between the complementary bearing surfaces 16 and 24 and the interaction between the bearing balls 19 and the race 26 and the depressions 17. Any load imposed on the outer member 22 is transferred to the inner member 15 in the region of the first portion 30. Thus, providing that the direction of action of the load is not a radial direction passing through the first portion 30, the position of transfer of the load from the outer member to the inner member is spaced from the centre of the inner member in a direction transverse to the direction of action of the load. If the axle 12 is connected in the normal manner to, for example, a wheel supported by a surface there will be a reaction to the load, which reaction will act through the centre of the axle and hence through the centre of the inner member 15. The inner member 15 is subject to a force couple comprising the load acting in the region of the first portion 30 and the reaction acting through the centre of the member. By suitable orientation of the device 10 with regard to the direction of action of the load and the direction of rotation of the inner member, the force couple may be exploited to enhance the relative rotation of the inner and outer members.

It will be appreciated that although, in the embodiment described, the complementary bearing surfaces 16 and 24 are smooth surfaces they may be adapted to use ball- or roller-bearings.

WHAT WE CLAIM IS:—

1. A rotary bearing device comprising an inner member and an outer member, one of said members being fixed and the other being rotatable with respect to the fixed member, said inner and outer members having complementary bearing surfaces wherein the bearing surface arranged on the inner member has a larger diameter than the bearing surface arranged on the outer member and the bearing surface on said inner member surrounds the bearing surface on said outer member, rolling elements being provided between inner and outer races arranged on the inner and outer members respectively, the race arranged on the fixed member being non-circular and acting to displace the rotatable member to a non-concentric position relative to the fixed member such that a load imposed on the fixed member is transferred to the rotatable member at a position spaced from the centre of the rotatable member in a direction transverse to the direction of action of the load.

2. A rotary bearing device according to claim 1, wherein the race arranged on the fixed member comprises a major portion of substantially constant distance from a point in the plane of the race, and a minor portion of smaller distance from the said point.

3. A rotary bearing device according to claim 1 or 2, wherein the complementary bearing surfaces comprise at least one pair of complementary frusto-conical surfaces.

4. A rotary bearing device according to claim 3, wherein the complementary bearing surfaces comprise two pairs of complementary frusto-conical surfaces, the pairs of surfaces tapering in axially opposite directions thereby limiting the axial movement of the inner member within the outer member.

5. A bearing device according to claim 4, wherein the two pairs of complementary frusto-conical surfaces are spaced apart in the axial direction and have their larger diameter ends adjacent.

6. A rotary bearing device according to any of claims 3 to 5, wherein the bearing surface on the inner member is co-axial with the inner member and the bearing surface on the outer member is co-axial with the outer member.

7. A bearing device according to any of the preceding claims wherein the device is adapted to have the outer member mounted in a fixed housing and the inner member mounted on an axle rotatable within the housing.

8. A bearing device according to any of the preceding claims, wherein the rolling elements comprise bearing balls and the race arranged on the rotating member is provided with retaining means for the bearing balls.

9. A bearing device substantially as hereinbefore described with reference to the accompanying drawings.

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1 531 270 COMPLETE SPECIFICATION
1 SHEET

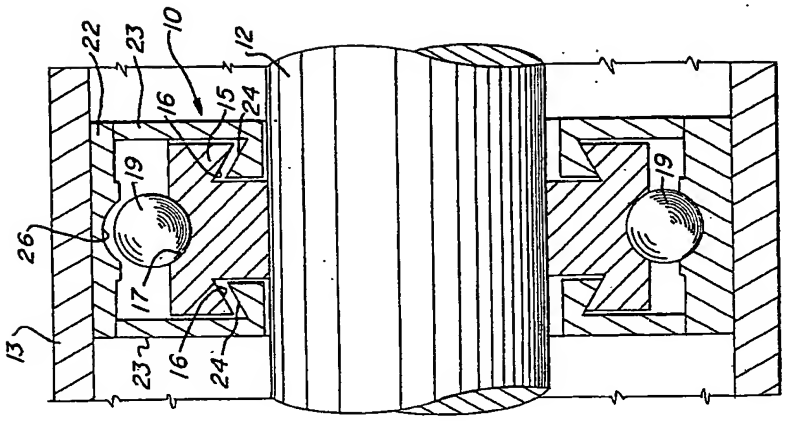

Fig_2

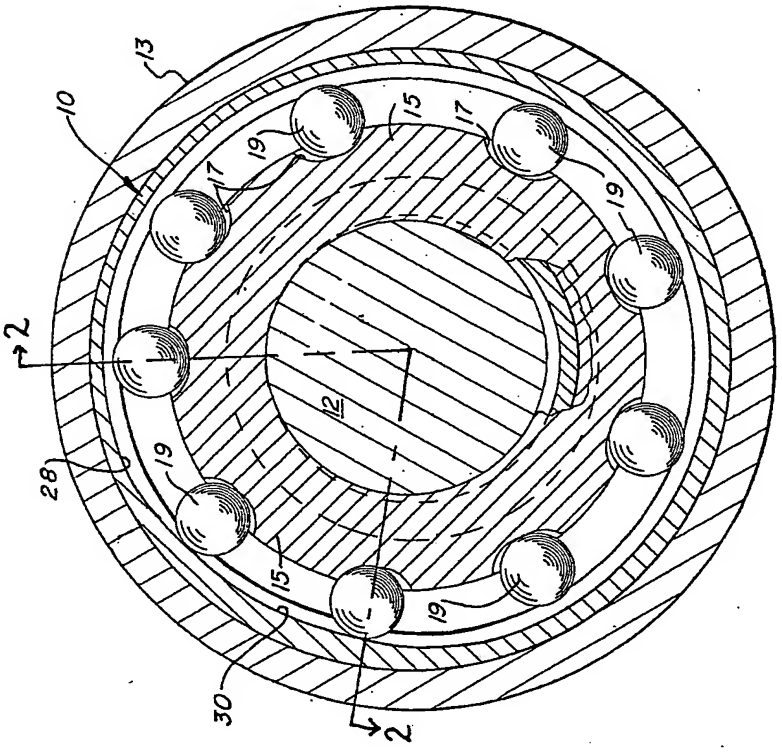

Fig_1